Swainson's Hawk (*Buteo swainsoni*)

Photo by Dudek.

Legal Status

State: Threatened
Federal: U.S. Fish and Wildlife Service Bird of Conservation Concern
Critical Habitat: N/A
Recovery Planning: N/A

Taxonomy

The Swainson's hawk (*Buteo swainsoni*) is monotypic with no currently accepted subspecies (Bechard et al. 2010). It is most closely related to the Galapagos hawk (*B. galapagoensis*) (Bollmer et al. 2006, Hull et al. 2008), which, combined with their migration patterns, indicates a South American origin for this species (Mayr and Short 1970). Hull et al. (2007) examined the genetic diversity of Swainson's hawks throughout their North American breeding range and concluded that California's Central Valley population was genetically distinct from other populations, although the distinction was not great enough to meet the standards for an evolutionarily significant unit, as defined by Moritz (1994) as a historically isolated set of populations. Moritz (1994) further stated that "ESUs should be reciprocally monophyletic for mtDNA and alleles and show significant divergence of allele frequencies at nuclear loci." Limited dispersal data suggest that populations from different parts of the breeding range do not readily mix on their South American wintering grounds (Woodbridge et al. 1995a). Further, the California Central Valley hawks have recently established a wintering population in southwestern Mexico and a small wintering population of about 30 birds in Sacramento-San Joaquin River Delta in the Central Valley (Herzog 1996; Wheeler 2003; Bradbury unpublished data). These observations support the hypothesis that Swainson's hawks from California's Central Valley are distinct from populations elsewhere including birds from the southwestern deserts which are most closely related to birds from the

Great Basin and Great Plains. Work conducted by Woodbridge in Butte Valley in northeastern California found that the behavior of the Central Valley population was different from the Butte Valley population (England pers. comm. 2012).

Distribution

General

Swainson's hawks breed in the grasslands, shrub-steppe, desert, and agricultural areas of the Columbia Basin, Great Basin, Great Plains, American Southwest, and the Central Valley of California (Bechard et al. 2010) (Figure SP-B12). In California, approximately 94% of the breeding pairs now occur in the Central Valley (CDFG 2007) with most found between Modesto and Sacramento (Bloom 1980). Smaller California breeding populations are also found in the Great Basin in the extreme northeastern California portion of the state, in the Owens River Valley, and in nearby Fish Lake Valley on the Nevada border. Remnant (or recolonizing) populations in Southern California are found in the western Mojave Desert in the Antelope Valley and in the eastern Mohave Desert in the Mojave National Preserve. Historically, Swainson's hawks nested throughout the California lowlands, including coastal valleys and plains where they no longer occur today (Bloom 1980).

Specific locations where Swainson's hawks have been reported breeding in southeastern California include near Cima Dome and Lanfair Valley in San Bernardino County, at Oasis Ranch in Mono County, and near Lancaster in Los Angeles County. The species formerly bred in Joshua tree woodland habitat near Victorville and Adelanto in San Bernardino County (England and Laudenslayer, cited in Latting and Rowlings 1995).

Migrating Swainson's hawks pass through Anza Borrego State Park and Morongo Valley in spring. In fall, hawks also migrate through the eastern Colorado Desert and along the Colorado River. While most birds winter in South America, there are small, isolated wintering populations in the Sacramento-San Joaquin River Delta in California and in southern Florida (Natural Resource Consultants and Western EcoSystems Technology, Inc. 2011), as well as Mexico (England, pers. comm. 2012).

Distribution and Occurrence within the Plan Area

Historical

Historically, Swainson's hawks were much more common in the Southern California deserts than they are today (Sharp 1902; Bloom 1980). Bloom (1980) estimated that the Mojave/Colorado Deserts population declined by 95% in the previous century. Current nesting territories in Southern California may represent recolonizations (Woodbridge 1998). There are four historical (i.e., pre-1990) occurrence records in the Plan Area and an additional three records with an unknown observation date (CDFW 2013; Dudek 2013). The four historical occurrences with known observation dates include a 1927 occurrence east of Lancaster and south of E. K8, and 1979 and 1982 occurrences in the eastern portion of the Mojave National Preserve (Figure SP-B12). The latter three historical nest territories in the Lanfair Valley within the Mojave National Preserve had last reported activity in the early 1980s. The occurrences with no observation date in the Dudek (2013) dataset include a site along E. Avenue I east of Lancaster, a site along E. Avenue J east of Lancaster (both of which are north of the 1997 occurrence east of Lancaster), and site north of Fremont Wash and east of State Highway 395 (Figure SP-B12).

Recent

There are 52 recent (i.e., since 1990) occurrences for Swainson's hawk in the Plan Area (CDFW 2013; Dudek 2013) (Figure SP-B12). Most breeding pairs within the DRECP area are located in the western Mojave along the base of the San Gabriel and Tehachapi Mountains and in the Antelope Valley. Approximately ten pairs nest over a relatively wide area in the Antelope Valley (Bloom 2011). Several pairs nest in the upper Owens River Valley, just north (outside) of the DRECP area. However, an isolated Owens River Valley nesting territory (active in 2003) does occur inside the DRECP area at Haiwee Reservoir (Bloom 2011). Scattered recent occurrences are located in the Fremont Valley, the Ridgecrest/China Lake Naval Air Weapons Station, and near Haiwee Reservoir. There is a single occurrence south of the Salton Sea from 2003.

Natural History

Habitat Requirements

Swainson's hawks are primarily a grassland bird but they are also found in sparse shrubland and small, open woodlands (Bechard et al. 2010). In Central California Swainson's hawks are primarily associated with grain and hay croplands that mimic native grasslands with respect to prey density and availability (Estep 1989; Babcock 1995). They generally nest in isolated trees, narrow bands of vegetation, or along riparian corridors in grassland, shrubland, and agricultural landscapes. Within the DRECP area, Joshua trees (*Yucca brevifolia*) and non-native ornamental trees or trees planted as windbreaks also function as nest sites (CEC and CDFG 2010; Table 1).

Most Swainson's hawks winter in the pampas (grasslands) of South America, but there they have adapted to agricultural lands, as they have on their North American breeding grounds (Woodbridge et al. 1995a). Foraging habitat includes dry land and irrigated pasture, alfalfa, fallow fields, low-growing row or field crops, new orchards, and cereal grain crops. In the Plan Area, in addition to alfalfa fields in the Antelope Valley, Swainson's hawks may also forage in grasslands, Joshua tree woodlands, and other desert scrub habitats that support a suitable prey base.

Table 1. Habitat Associations for Swainson's Hawks in the Plan Area

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Information
Cropland	Foraging; nesting	Primary	Adapted to foraging in agricultural fields, but not in crops that grow higher than native vegetation. Nests in isolated trees or in adjacent riparian vegetation	Direct observations
Joshua tree woodlands	Nesting	Secondary	Historically nested in Joshua tree woodlands, now also in ornamental roadside trees and	Direct observations

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Information
			wind row trees (see above)	
Desert grasslands	Foraging	Primary	Forages in open landscapes with low and/or widely spaced vegetation	Direct observations
Desert scrub	Foraging	Secondary	See above	Direct observations

Sources: Bechard 1982; CEC and CDFG 2010; Estep 1989

Foraging Requirements

In North America, breeding Swainson's hawks prey chiefly upon small rodents such as young ground squirrels (*Spermophilis* spp.), pocket gophers (*Thomomys* spp.), deer mice (*Peromyscus* spp.), and voles (*Microtus* spp.). Voles are especially important to Central California hawks. Their breeding season diet also includes birds, snakes, and insects (especially grasshoppers and crickets) (Snyder and Wiley 1976; Fitzner 1980; Bednarz 1988; Estep 1989). Non-breeding birds in North America and wintering birds in South America feed almost exclusively on insects, especially grasshoppers (Synder and Wiley 1976; Johnson et al. 1987; Sarasola and Negro 2005).

In addition to insects, Swainson's hawks in the Antelope Valley forage primarily on Botta's pocket gopher *(Thomomys bottae*) in agricultural areas and on a wider variety of prey in desert scrub and grassland habitats (CEC and CDFG 2010).

Reproduction

Swainson's hawks arrive on the breeding grounds in March-April (March in Central California) (Table 2) and begin a week-long nest building phase 1 to 2 weeks after arrival (Fitzner 1980). The egg-laying through fledging period lasts about 73 days per nest, but can last 110 days for the local population (Olendorff 1973). Adjacent pairs can be out of sync by 25 days (Woodbridge 1987). Typical clutch size is 2 or 3 eggs (Olendorff 1973; Fitzner 1980; Bechard 1983; Bednarz

and Hoffman 1986) and typically about 2 young are fledged per successful nest (range of 1.62 to 2.18) (Bechard et al. 2010. A study of rural and urban nest sites central California found 1.65 and 1.64 young fledged per successful nest site, respectively (England et al. 1995). The number of fledglings can average less than 1 during years of low prey availability (i.e., not all nests are successful) (Bechard 1983). Young generally fledge mid-July to mid-August at an average age of 43 days (Olendorff 1973, Fitzner 1980, Woodbridge 1987).

Table 2. Key Seasonal Periods for Swainson's Hawks

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding				✓	✓	✓	✓	✓				
Migration		✓	✓						✓	✓		
Wintering	✓	✓									✓	✓

Notes: Central Valley (California) Swainson's hawks arrive a month earlier on breeding grounds than other populations, possibly because they winter in central Mexico (Bradbury unpublished) rather than Argentina.

Sources: Wheeler 2003, Bechard et al. 2010

Spatial Behavior

Spatial behaviors by Swainson's hawk include migration patterns, breeding home range use, and natal dispersal.

Migratory movements occur annually between North American breeding grounds and wintering areas primarily located in South America, although some Swainson's hawks use wintering grounds in California and Mexico (Fuller et al. 1998; Bechard et al. 2010; Wheeler 2003; Bradbury unpublished data). Immature birds and post-breeding adults begin forming migration flocks in August and September, and begin the fall migration in September. Birds migrating to South America leave North America by October and arrive in Argentina in November (Bechard et al. 2010). The return migration begins late-February and early March in Argentina (Bechard et al. 2010), with birds arriving in California from early March (Central

Valley) through April (other California populations). Fuller et al. (1998) tracked 27 Swainson's hawks on their 1996 and 1997 southbound migrations and recorded a mean cumulative travel distance of over 13,500 kilometers (8,370 miles).

Local movements of California hawks are primarily confined to home ranges, which vary greatly in size (from 69 to 8,718 hectares) among populations (Bechard et al. 2010). Smaller home ranges (e.g., less than 1,000 hectares) tend to occur areas with suitable foraging habitat such as alfalfa, fallow fields and dry pastures, while large home ranges (e.g., greater than 2,500 hectares) tend to occur in areas less suitable foraging habitat, such as mature grains and row crops, vineyards, and orchards (Bechard et al. 2010). Natal dispersal also varies greatly among populations. Central California hawks disperse only a few kilometers (mean of 3.5 kilometers; Estep 1989), while northeastern California hawks disperse farther (mean of 9 kilometers) (Woodbridge et al. 1995b). But in greater contrast, juvenile Swainson's hawks in Saskatchewan apparently disperse to distances exceeding 200 kilometers (Houston and Schmutz 1995).

Table 3. Movement Distances for Swainson's Hawks

Type	Distance/Area	Location of Study	Citation
Home Range	69–8,718 ha	Washington, Oregon	Fitzner 1978; Bechard; 1989; Woodbridge 1991
Dispersal Range	3.5–9 km	California	Estep 1989; Woodbridge et al. 1995b
Migration	Mean of 13,504 km southward, 11,592 km northward	United States	Fuller et al. 1998

Notes: ha = hectare; km = kilometer. Home range depends on habitat type.

Ecological Relationships

Predator–prey relationships are critical for Swainson's hawk. Conversion of suitable nesting and foraging habitat in some locations in North America, and especially Central California (Risebrough et al. 1989), has led to the loss of nesting opportunities and reduction of

prey populations due to conversion of native grassland to cropland. Where agricultural conversion has been to crop types not suitable for foraging and alternative nesting opportunities have not been created, Swainson's hawk populations have dexlined (Bloom 1980; Bechard et al. 2010). Also, because of their dependence on insect prey, especially grasshoppers on the wintering grounds, Swainson's hawks are highly susceptible to secondary poisoning from insecticides (Woodbridge et al. 1995a).

Swainson's hawks occasionally lose nestlings or fledglings to great horned owl (*Bubo virginianus*) predation (Fitzner 1978; Littlefield et al. 1984; Woodbridge 1991), and Swainson's hawks themselves have preyed on burrowing owl (*Athene cunicularia*) fledglings (Clayton and Schmutz 1999). Interspecific competition and territoriality occurs between Swainson's hawk and sympatric buteos (e.g., red-tailed hawks [*Buteo jamaicensis*]) over control of nest sites, although Swainson's hawks appear to dominate in most such encounters (Janes 1984).

Population Status and Trends

Global: Secure (NatureServe 2010)
State: Imperiled (NatureServe 2010)
Within Plan Area: Imperiled (CEC and CDFG 2010)

In California, Swainson's hawk is vulnerable to extirpation due to its very restricted range (primarily the Central Valley), few populations, steep population declines, and loss of habitat. Bloom (1980) concluded that the California Swainson's hawk population had declined 90% since 1900 when Sharp (1902) considered the species abundant. Much of this decline occurred in Southern California, where the species was once considered abundant in coastal valleys (Sharp 1902) but is now completely absent. Based on its large decline, Swainson's hawk was listed as a state-threatened species in 1983. Later inventories estimated populations of 800 hawks in 1988 and 1,000 hawks in 1994 (CDFG 2007). The CDFG initiated an inventory of Swainson's hawk breeding pairs in California in 2005 and 2006 (CDFG 2007a). Based on a randomized sampling, the CDFG estimated a breeding population of 1,912 pairs (95% confidence interval of 1,471 to 2,353 pairs) in 2005 and 2,251 breeding pairs (95% confidence interval of 1,811 to 2,690 pairs) in 2006. The combined estimate for

2005–2006 is 2,081 pairs (95% confidence interval of 1,770 to 2,393 pairs). Approximately 94% of the breeding pairs now occur in the Central Valley.

Swainson's hawk populations in the Mojave and Colorado desert portions of the DRECP area have also declined severely in the past century. Bloom (1980) estimated that this region once supported 270–1,080 pairs, but abundance has since declined as much as 95%. Today, a few nesting pairs occur in Antelope Valley at the extreme western edge of the Mojave Desert and primarily forage in the alfalfa fields and other agricultural areas in the region (CEC and CDFG 2010; Bloom 2011). They also forage in grassland, Joshua tree woodlands, desert scrub habitats (CEC and CDFG 2010). A small breeding population has been identified at Mojave National Preserve near the Nevada border (CNDDB 2011). The Owens Valley population is principally found immediately north of the DRECP boundary, but there is one record inside the Plan Area south of Owens Lake, and in the future the Owens Lake population may further expand into the Plan Area. These small, isolated populations could be remnants of the much larger historical population, or they could be recent colonists, in which case the Southern California population would be growing.

Threats and Environmental Stressors

The decline of Swainson's hawks in California has been attributed to riparian habitat loss and agricultural and urban development in the Central Valley (Bloom 1980; England et al. 1995), urbanization in the coastal valleys and plains (Bloom 1980), and a contracting range of Joshua trees and riparian habitats in the Mojave Desert (Bloom 1980). It was estimated that by the mid-1980s, approximately 93% of riparian habitat in the San Joaquin Valley and 73% of riparian habitat in the Sacramento Valley had been lost since the 1850s (CDFG 1994). Chronic and acute pesticide poisoning also affects the Swainson's hawk (Goldstein et al. 1996; Risebrough et al. 1989). Pesticide use on South American wintering grounds threatens all North American populations. South American birds have died from ingesting pesticides targeting grasshoppers (Woodbridge et al 1995a; Goldstein et al. 1996). Goldstein et al. (1996) estimated that 4,100 Swainson's hawks died in 1 year, 1996, from acute pesticide poisoning in Argentina.

Wildfires, lowering of water tables, and flood control also continue to threaten riparian and woodland nesting habitat in California. Off-road vehicle activity and shooting can also disrupt nesting, although the latter is not as important a factor as it once was. Intraspecific competition or aggression with other raptors and common ravens (*Corvus corax*) has been suggested as a stressor elsewhere in the western United States (Janes 1987; Littlefield et al. 1984).

Conservation and Management Activities

There are no active conservation efforts specific to Swainson's hawks in the DRECP area. The CEC and CDFG have developed protocols to avoid and minimize impacts of renewable energy projects on Swainson's hawk in the Antelope Valley (CEC and CDFG 2010). These protocols include methods for conducting pre-project surveys within a 5-mile radius of a proposed project. If active nests are found in proximity to a project a Monitoring and Mitigation Plan is required. Potential avoidance and minimization measures include maintaining sufficient foraging and fledgling area; providing a 0.5-mile buffer zone during construction between project activities and an active nest; avoiding nest trees to extent feasible; and providing habitat management lands to offset habitat losses within 0.5 mile of an active nest. The overarching objective of these protocols avoid significant impacts to nesting and foraging individuals and thus to enable renewable energy projects to comply with CEQA and CESA regulations regarding the Swainson's hawk.

Further, the Los Angeles Audubon Society is focusing conservation efforts towards the approximately ten pairs of Swainson's hawks inhabiting the Antelope Valley. This effort has been largely confined to encouraging the City of Lancaster to consider Swainson's hawk conservation in any future solar energy permitting.

The Desert Bird Conservation Plan, jointly developed by the California Partners in Flight (CalPIF) and Point Reyes Bird Observatory (PRBO) Conservation Science, is a non-regulatory document designed to assist land-managers in improving habitat condition for desert birds of the Mojave and Colorado Deserts (the portion of the Sonoran Desert in the Plan Area). Although Swainson's hawks are not a focal species in the Desert Bird Conservation Plan, the plan does promote restoration

of Joshua tree habitats that are important to nesting Swainson's hawks. Statewide, Swainson's hawks are a focus of the CalPIF/PRBO Riparian Bird Conservation Plan, which recognizes the importance of riparian trees (e.g., Fremont cottonwood [*Populus fremontii*]) as nesting habitat for California Swainson's hawks.

The Friends of the Swainson's Hawk, a grassroots organization founded in 1994, recently developed a conservation strategy for California Swainson's hawk populations. Although this strategy focuses on Central Valley populations, it does provide a framework for conservation and management of Swainson's hawks statewide.

The CDFG also published a staff report in 1994 regarding recommended mitigation for Swainson's hawk that includes recommendations for mitigation for impacts within a 10-mile radius of an active nest site; the 10-mile radius reflects common flight distances between an active nest and foraging habitat (CDFG 1994).

Data Characterization

The current status of nesting territories in the Owens River Valley and the Mojave National Preserve within the DRECP area is unknown. It is likely, however, that most of the Swainson's hawk concerns relative to DRECP will be in the western Mojave region where the large majority or nesting sites occur.

Management and Monitoring Considerations

Within the DRECP area, management and monitoring considerations include maintaining suitable nesting habitat and proximity to reliable food sources. Currently Swainson's hawks rely heavily on the alfalfa and other agricultural fields for prey (primarily gophers and insects), but they may also forage in desert scrub and Joshua tree woodland habitats within flight distances from active nests (CEC and CDFG 2010; Bloom 2011). Potential disturbance of active nest sites from human activities is also a concern.

Species Modeled Habitat Distribution

This section provides the results of habitat modeling for Swainson's hawk, using available spatial information and occurrence information, as appropriate. For this reason, the term "modeled suitable habitat" is used in this section to distinguish modeled habitat from the habitat information provided in Habitat Requirements, which may include additional habitat and/or microhabitat factors that are important for species occupation, but for which information is not available for habitat modeling.

There are 1,615,796 acres of modeled suitable habitat for Swainson's hawk in the Plan Area. Appendix C includes a figure showing the modeled suitable habitat in the Plan Area.

Literature Cited

Babcock, K. W. 1995. "Home range and habitat use of breeding Swainson's hawks in the Sacramento Valley of California." *Journal of Raptor Research* 29(3):193–197.

Bechard, M. J., C. S. Houston, J. H. Sarasola and A. S. England. 2010. "Swainson's Hawk (*Buteo swainsoni*)." The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/265.

Bechard, M. J. 1982. "Effect of vegetative cover on foraging site selection by Swainson's Hawk." *Condor* 84:153-159.

Bechard, M. J. 1983. "Food supply and the occurrence of brood reduction in Swainson's Hawk." Wilson Bulletin 95:233–242.

Bednarz, J. C. 1988. "A comparative study of the breeding ecology of Harris' and Swainson's hawks in southeastern New Mexico." *Condor* 90:311–323.

Bednarz, J. C. and S. W. Hoffman. 1986. "The status of breeding Swainson's Hawks in southeastern New Mexico." Pages 253-259 *in Proceedings of the Southwest raptor management symposium.* Vol. 11 (Glinski, R. L., B. G. Pendelton, M. B. Moss, M N. LeFranc, Jr., B. A. Millsap, and S. W. Hoffman, Eds.) Natl. Wildl. Fed. Sci. Tech. Ser. no.

Bloom, P. 2011. Conference call with Pete Bloom and Greg Green (ICF International). February 16, 2011.

Bloom, P. H. 1980. *The status of the Swainson's Hawk in California, 1979.* Nongame Wildlife Investigations, Job II-8.0. Wildlife Management Branch, California Department of Fish and Game, Sacramento, California.

Bollmer, J. L., R. T. Kimball, N. K. Whiteman, J. H. Sarasola, and P. G. Parker. 2006. "Phylogeography of the Galapagos hawk (*Buteo galapagoensis*): A recent arrival to the Galapagos Islands." *Molecular Phylogenetics and Evolution* 39(1):237–247.

Bradbury, M. Unpublished data on migratory patterns and wintering range of the Central Valley Swainson's hawk.

CDFG. 2007. *California Swainson's Hawk Inventory: 2005–2006*. U.C. Davis Wildlife Health Center and Department of Fish and Game Resource Assessment Program. P0485902.

CDFG. 1994. Staff Report Regarding Mitigation for Impacts to Swainson's Hawk (*Buteo swainsonii*) in the Central Valley California.

CDFW (California Department of Fish and Wildlife). 2013. "*Buteo swainsoni.*" Element Occurrence Query. California Natural Diversity Database (CNDDB). Rarefind Version 4.0 (Commercial Subscription). Sacramento, California: CDFW, Biogeographic Data Branch. Accessed February 2013. http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp.

California Energy Commission and California Department of Fish and Game. 2010. *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California*. June.

Clayton, K. M. and J. K. Schmutz. 1999. "Is the decline of Burrowing Owls *Speotyto cunicularia* in prairie Canada linked to changes in Great Plains ecosystems?" *Bird Conservation International* 9(2):163–185.

Dudek. 2013. "Species Occurrences–*Buteo swainsoni*." DRECP Species Occurrence Database. Updated November 2011.

England, A.S. 2012. Personal communication (email and profile review comments) from A.S. England (UC Davis) to M. Unyi (ICF). May 15, 2012.

England, A. S., J. A. Estep, and W. R. Holt. 1995. "Nest-site selection and reproductive performance of urban nesting Swainson's hawks in the Central Valley of California." *Journal of Raptor Research*

Estep, J. A. 1989. *Biology, movements, and habitat relationships of the Swainson's hawk in the Central Valley of California.* California Department of Fish and Game, Wildlife Management Division. Sacramento, California.

Fitzner, R. E. 1978. *Behavioral ecology of the Swainson's Hawk* (Buteo swainsoni*) in southeastern Washington.* PhD Thesis. Washington State Univ. Pullman.

Fitzner, R. A. 1980. *Behavioral ecology of the Swainson's hawk* (Buteo swainsoni) *in Washington.* Report prepared for the U.S. Department of Energy's Pacific Northwest Laboratory. Richland, Washington. 65 pages.

Fuller, M. R., W. S. Seegar, and L. S. Schueck. 1998. "Routes and travel rates of migrating Peregrine Falcons *Falco peregrinus* and Swainson's Hawks *Buteo swainsoni* in the Western Hemisphere." *Journal of Avian Biology* 29(4):433–440.

Goldstein, M. I., B. Woodbridge, M. E. Zaccagnini, and S. B. Canavelli. 1996. "An assessment of mortality of Swainson's Hawks on wintering grounds in Argentina." *Journal of Raptor Research* 30:106–107.

Goldstein, M. I., T. E. Lacher, B. Woodbridge, M. J. Bechard, S. B. Canavelli, M. E. Zaccagnini, G. P. Cobb, E. J. Scollon, R. Tribolet, and M. J. Hopper. 1999. "Monocrotophos-induced mass mortality of Swainson's Hawks in Argentina, 1995–96." *Ecotoxicology* 8(3):201–214.

Herzog, S. K. 1996. "Wintering Swainson's Hawks in California's Sacramento-San Joaquin River Delta." *Condor* 98:876-879.

Houston, C. S. and J. K. Schmutz. 1995. "Swainson's Hawk banding in North America to 1992." *North American Bird Bander* 20:120–127.

Hull, J. M., R. Anderson, M. Bradbury, J. A. Estep, and H. B. Ernest. 2008. "Population structure and genetic diversity in Swainson's Hawks (*Buteo swainsoni*): implications for conservation." *Conservation Genetics* 9(2):305–316.

Hull, J. M., W. Savage, J. P. Smith, N. Murphy, L. Cullen, A. C. Hutchins, and H. B. Ernest. 2007. "Hybridization among buteos: Swainson's Hawks (*Buteo swainsoni*) x Red-tailed Hawks (*Buteo jamaicensis*)." *Wilson Journal of Ornithology* 119(4):579–584.

Janes, S. W. 1984. "Influences of territory composition and interspecific competition on Red-tailed Hawk reproductive success." *Ecology* 65:862–870.

Janes, S. W. 1987. "Status and decline of Swainson's Hawks in Oregon: the role of habitat and interspecific competition." *Oregon Birds* 13:165–179.

Johnson, C. G., L. A. Nickerson, and M. J. Bechard. 1987. "Grasshopper consumption and summer flocks of nonbreeding Swainson's Hawks." *Condor* 89:676–678.

Latting, J., and P.G. Rowlands. 1995. *The California Desert: An Introduction to Natural Resources and Man's Impact*. June Latting Books.

Littlefield, C. D., S. P. Thompson, and B. D. Ehlers. 1984. "History and present status of Swainson's Hawks in southeast Oregon." *Journal of Raptor Research* 18:1–5.

Mayr, E. and L. L. Short. 1970. "Species taxa of North American birds: a contribution to comparative systematics." *Publications of the Nuttall Ornithological Club,* No. 9.

Moritz, C. 1994. "Defining ''Evolutionarily Significant Units'' for Conservation." *Trends in Ecology and Evolution* 9:373–375.

Natural Resource Consultants and Western EcoSystems Technology, Inc. 2011. *A Biological Constraints Analysis of the approximately 4,191.7-acre Wildflower Green Energy Farm Site Located in Los Angeles County, California*. Prepared for Los Angeles County. June 14, 2011. Accessed February 23, 2011. http://planning.lacounty.gov/assets/upl/case/r2010-00256_bca.pdf.

Olendorff, R. R. 1973. *The Ecology of the Nesting Birds of Prey of Northeastern Colorado.* Technical Report No. 211. USIBP Grassland Biome.

Risebrough, R. W., R. W. Schlorff, P. H. Bloom, and E. E. Littrell. 1989. "Investigations of the decline of Swainson's Hawk populations in California." *Journal of Raptor Research* 23:63–71.

Sarasola, J. H. and J. J. Negro. 2005. "Hunting success of wintering Swainson's Hawks: environmental effects on timing and choice of foraging method." *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 83(10):1353–1359.

Sharp, C. S. 1902. "Nesting of Swainson Hawk." *Condor* 4:116–118.

Snyder, N. F. R. and J. W. Wiley. 1976. *Sexual Size Dimorphism in Hawks and Owls of North America.* Ornithological Monograph No. 20.

Schmutz, J. K. 1987. "The effect of agriculture on ferruginous and Swainson's hawks." *Journal of Range Management* 40(5): 438–440.

Wheeler, B. K. 2003. *Raptors of Western North America.* Princeton University Press, Princeton, New Jersey.

Woodbridge, B. 1987. *Biology and management of Swainson's Hawks in the Butte Valley, California.* U.S. Forest Serv., Klamath National Forest, Goosenest Ranger District, Mt. Hebron, CA.

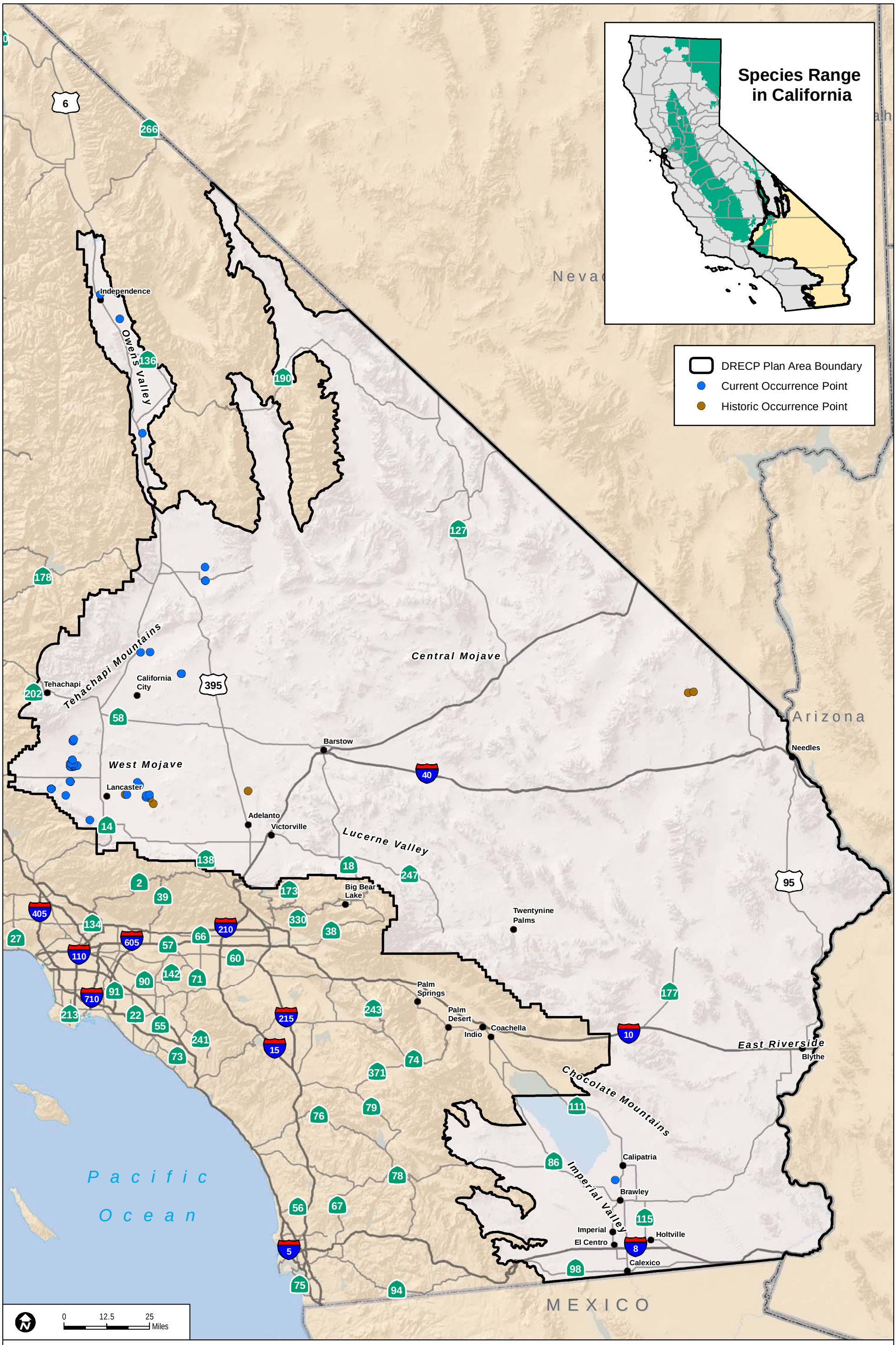
Woodbridge, B. 1991. *Habitat selection by nesting Swainson's Hawks: a hierarchical approach.* Master's Thesis. Oregon State University, Corvallis.

Woodbridge, B., K. K. Finley, and S. T. Seager. 1995a. "An investigation of the Swainson's Hawk in Argentina." *Journal of Raptor Research* 29:202–204.

Woodbridge, B., K. K. Finley, and P. H. Bloom. 1995b. "Reproductive performance, age structure, and natal dispersal of Swainson's Hawks in the Butte Valley, California." *Journal of Raptor Research* 29:187–192.

Woodbridge, B. 1998. *California Partners in Flight Riparian Bird Conservation Plan for the Swainson's Hawk.* Point Reyes Bird Observatory Website. 16 pp.

INTENTIONALLY LEFT BLANK



Sources: ESRI (2014); DRECP Species Occurrence Database (2013), CWHR (2008)

FIGURE SP-B10

Swainson's Hawk Occurrences in the Plan Area